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JOURNAL OF ELECTRICITY
POWER AND GAS
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VOLUME XXV SAN FRANCISCO, JULY 30, 1910. NUMBER 5

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MECHANICAL EQUIPMENT OF THE PALACE HOTEL

BY T. B. HUNTER AND R. A. HUDSON.

The Palace Hotel, San Francisco.

The Palace hotel, the largest hostelry on the Pacific Coast and one of the most widely known in the whole world, was erected by Senator William Ralston in 1875, on the block of land at Market and New Montgomery streets. At that time it was the largest hotel west of New York and in point of architecture, appointments and special features was a marvel among the hotels of both hemispheres. Chief of these features was the grand court 87 ft. by 133 ft., around which the building was built. The Palace was the rendezvous of all world travelers, students, statesmen, money kings, actors and society folk of importance who came to the Pacific Coast, and became the social political and industrial center of California. Here were

held the great society functions of the bonanza days, when $50,000 was spent in a single night, to celebrate the triumph of some social favorite. Here politicians met and careers were made and unmade. Here business men, mining magnates and industrial barons foregathered and over the little tables made deals that meant millions.

In the catastrophe of 1906, the Palace went through the earthquake unscathed, but fell victim to the fire which followed. It was completely gutted, but its walls remained unharmed. While other hotels in San Francisco were merely repaired and rebuilt, the Palace Hotel Company decided to erect an entirely new building for its guests. It took more than six months to tear down and clear away the old building. The new hotel was opened December 15, 1909, in an absolutely new and fireproof building. It presents all the famous features for which the old Palace was famous, with many new ones exclusively its own, making the Palace the most modern hostelry, and presenting a superior example of hotel construction and equipment. The Palace covers two and one-half acres in the heart of San Francisco's banking and business centers. It rises nine stories and is built of steel, concrete and brick.

The mechanical equipment of the Palace hotel includes a complete electric plant of 900 k.w. rated capacity with foundation for one additional 300 k.w. unit for future business; complete wiring systems for lights, motors, telephones, bells and clocks; a complete pumping plant for elevators and house service; water filters capable of filtering 452,000 gals. per 24 hrs. with necessary storage tanks, etc., and provision for the future installation of a water softener plant; an ice making and refrigerator plant of 35 tons of refrigerating capacity; a complete system of direct steam heating for the sleeping floors and an indirect system for the basement, main floor and the bath rooms on the sleeping floors; and a complete vacuum scrubbing and sweeping plant.

Engine and Boiler Room

The engine and boiler room is in the basement near the Market street side. The top of the engine room floor is 30 ft. 3½ in. below the Market street sidewalk and 5 ft. below the mean level of the ground water. The bottom of the engine foundations is 10 ft. below the engine room floor.

To counteract the upward pressure of the ground water, a special floor 3 ft. thick was placed. This floor was made of copper slag concrete mixed in such proportion that the weight of the concrete, as determined by test, was 190 lb. per cu. ft. For a floor 3 ft. thick this gives a total weight per square foot of floor of 570 lb. which is sufficient to counteract the upward thrust due to the ground water pressure which in this case is 500 lb. per sq. ft. of floor.

This floor is cut by pipe trenches varying in width from 12 in. to 10 ft. 9 in., and in depth from 12 in. to 2 ft. 6 in. The bottoms of the trenches were reinforced with steel rods and thickened so as to transmit the stresses to the adjacent uncut portions of the floor and the building column footings.

The entire engine and boiler room floor was waterproofed with 5-ply Hydrex felt laid six inches above the bottom of the 3 ft. slab. This waterproofing was carried up the side walls and all columns penetrating the floor slab to a point 7 ft. above the floor level.

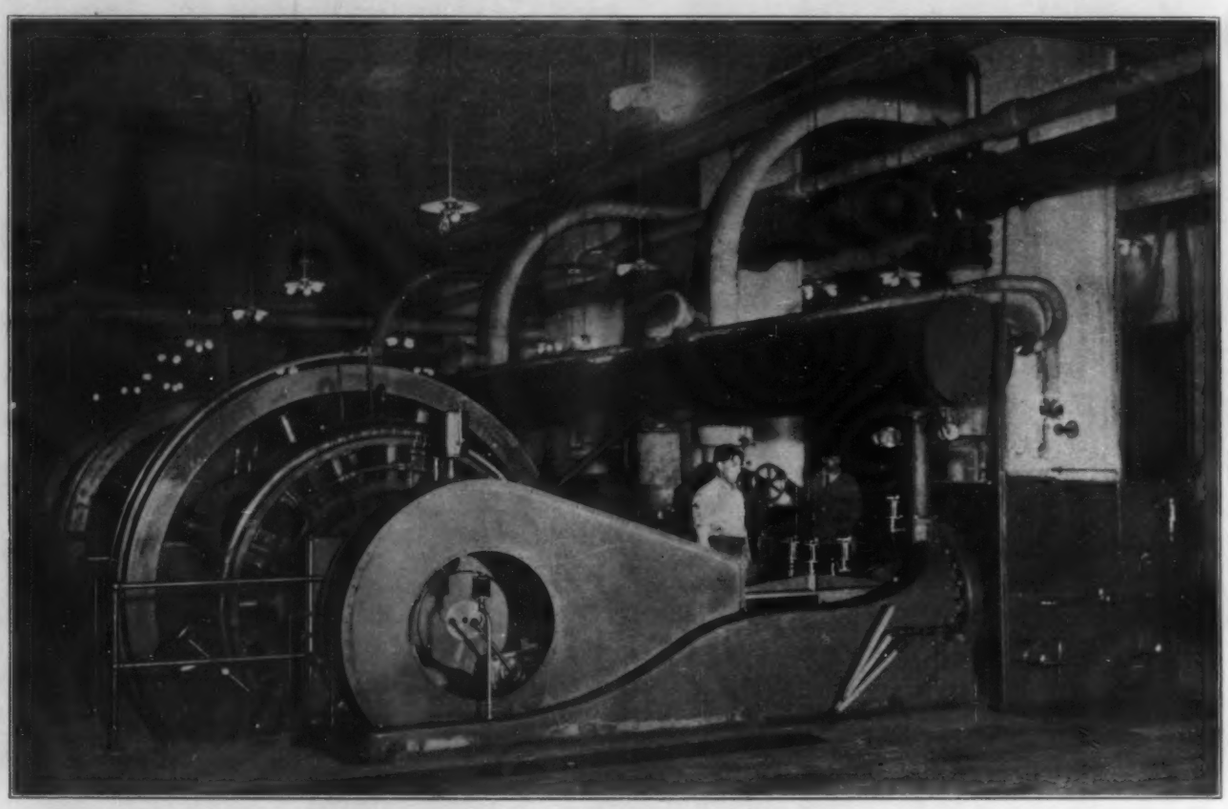
Two open concrete sumps extending to a point 5 ft. 6 in. above the engine room floor were built to act as reliefs and overflows in case a raise in the ground water level should increase the upward thrust on the floor greater than that for which it was designed. In one of these sumps is a 2 in. centrifugal pump direct connected to a 3 h.p. Westinghouse d.c. motor. In case the water level could not be controlled by this pump, the overflow from the sump will run through the trenches to the two sump tanks and be pumped into the sewer by the sump pumps or the 7 in. centrifugal circulating water pumps.

Boiler Room.

The lower 7 ft. of the engine foundations was placed before the engine room floor was laid, and was carried up to the bottom of the floor slab. The top 3 ft. corresponding to the floor thickness, was placed at the same time the floor was laid. In order to prevent vibration being transmitted from the engines to the building columns through the engine room floor, which was bonded to both the engine foundations and to the building columns, special care was exercised in the design of this part of the plant. The engine foundations were made extra heavy, being for the four units a monolithic mass 85 ft. long, 10 ft. deep and varying in width from 21 ft. to 27 ft. 4 in. The original column schedule provided for a row of columns in the center of the engine room. The footings of these would have been under the engine foundations or so close to them that there would have been great danger of vibration being transmitted through the columns to the steel frame of the building. The row of columns was removed and the load carried to the adjacent ones by plate girders. Around each column of the two rows on the opposite sides of the engines, was cast a concrete casing 4 ft. by 4 ft. running from the

column footing to the engine room ceiling. This casing was bonded to the engine room floor with reinforcing rods. The inertia of the mass of concrete in the engine foundations, engine room floor and column casings was estimated to counteract and absorb the vibrations of the engines before reaching the steel frame of the building.

As an additional precaution, the fly wheels of the engines were made heavier than the standard for machines of this size. One of the reasons for using cross compound engines instead of the tandem type was that probably the pistons of the three or four engines of the tandem type of the same size and running at the same speed would often run in step. The effect of this would be to impart to the foundations and floor a swaying motion corresponding to the strokes. With the cross compound type with cranks 90 degrees apart the danger from this would be minimized. It was thought that the elimination of all vibration warranted the extra expense of the cross compound type as well as the extra cost of the column casings.



McIntosh & Seymour Engines, each driving 300 kw. Westinghouse Generator.

Boilers.

The present installation consists of three Babcock and Wilcox boilers of the inclined wrought steel header type, designed for 200 lb. working pressure. Each boiler is set singly and is made up of 18 sections of 18 ft. by 4 in. tubes, 10 tubes high, with two steam and water drums 42 in. diam. Each boiler contains 3749 sq. ft. of heating surface.

The guaranteed efficiency of the boilers is 79 per cent at rated capacity with California crude oil, having a calorific value of 18500 B.t.u. per lb. with a limit of water, sand and silt of ½ per cent. Each boiler is fitted with a Babcock and Wilcox superheater which will heat the steam from 100 degrees to 120 F. above the temperature corresponding to the working pressure of 200 lb. per sq. inch. Space has been provided for the installation of two additional boilers should the outside load on the plant make it necessary.

Breeching and Stack.

A reinforced concrete breeching with two compartments, making provision for the installation of a fuel economizer extends across the rear end of the boilers. This breeching is equipped with eight explosion doors which will open and relieve the pressure in case of gas explosion in the breeching. These doors are hinged and counterweighted so that as soon as the force of the explosion is relieved they automatically close.

On account of changes in the alignment of the breeching both horizontally and vertically for the short distance between the boiler nearest the stack and the stack, this portion of the breeching was made of riveted steel. The steel portion is covered with 2 in. magnesia blocks, canvas wrapped, with a 2 in. air space between the magnesia and the steel.

In the stack compartment, a 12 by 12 ft. shaft running through the building from the basement to the roof, is placed the smoke stack. This is of riveted steel construction 66 in. diameter by 168 ft. high and was built in place. It is self supporting but is stayed laterally at the second, fifth and pent house floors by roller-guides riveted to channels crossing the stack compartment.

Engines.

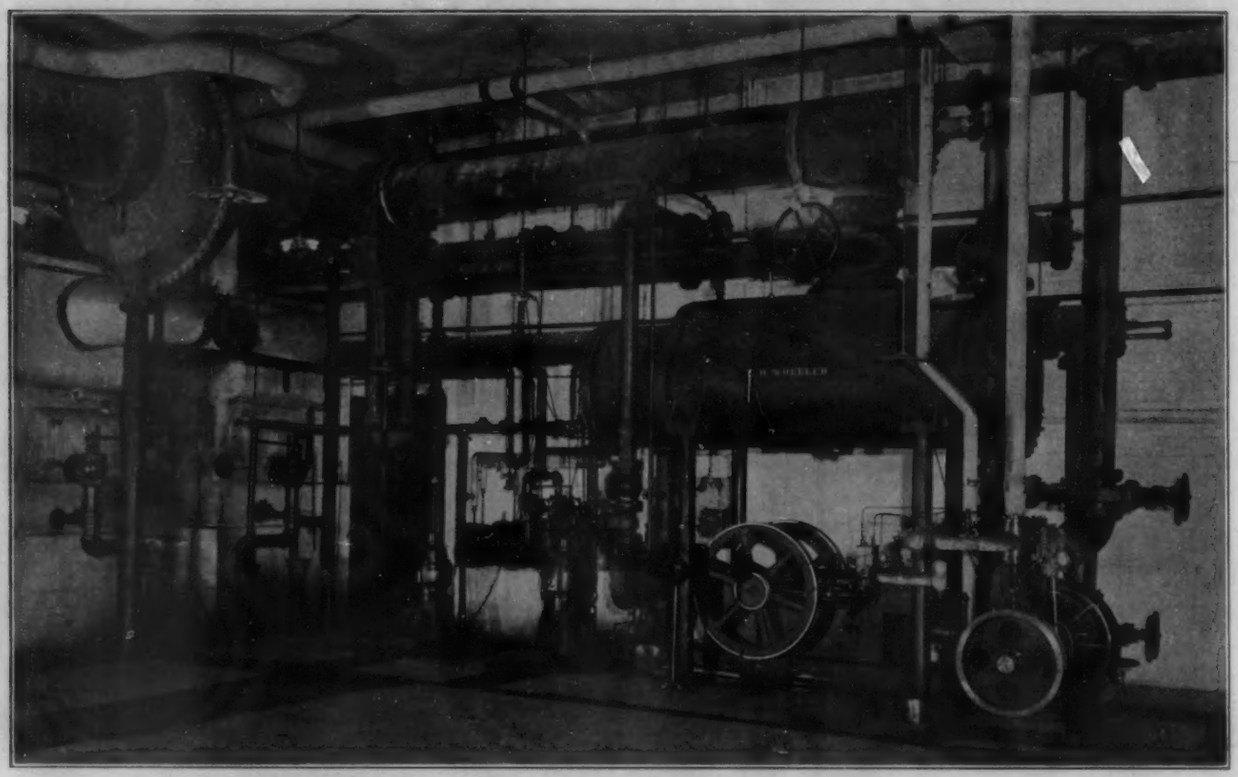
The present engine installation consists of three horizontal, cross compound, McIntosh and Seymour engines, each direct connected to a 300 k.w. generator. The engines run at 150 r.p.m. The principal dimensions of the engines follow: Diameter h. p. cylinder 14 in.; diameter l. p. cylinder 30 in.; stroke 30 in.; weight 88,000 lb.; diameter fly wheel 11 ft.; weight fly wheel 16,000 lb.

The re-heating receiver is placed above the cylinders as herewith shown, on account of the difficulty and cost of making a water tight pit below the cylinders.

Force feed lubricators are provided for each cylinder. The main bearings are fitted with a self-oiling device consisting of settling tank in the engine frame being on the roof. In order to withstand this head an extra heavy shell was provided on both this pump and the water chambers of the condenser.

On the roof is one Wheeler-Pratt forced draft water cooling tower of sufficient capacity to cool the water for condensing 12,000 lb. steam per hour at 26 in. vacuum. The tower is fitted with one 10 ft. disc fan direct connected to a 15 h. p. Westinghouse motor with a maximum speed of 225 r.p.m. This motor is fitted with a speed controller for varying the speed from half to full speed.

A 12 in. circulating line connects the condenser and pump in the basement with the tower on the roof. On the pump discharge line near the pump is placed a Crane No. 41 E automatic stop and check valve to prevent the flooding of the basement should a break occur



Condenser Equipment.

from which a pump, driven from the valve gear, delivers a continuous stream of oil to the bearings. The main bearings are also fitted with cylindrical hollow shells for water circulation. Water is taken from the cold water system of the house, passed through these bearings and run to the hot well as "make up water."

Condenser Equipment.

One complete condenser unit was installed, consisting of one C. H. Wheeler surface condenser with 2000 sq. ft. cooling surface; directly beneath the condenser is a 6 in. by 12 in. by 10 in. Wheeler-Mullan horizontal suction valveless steam driven vacuum pump. The circulating water pump is a 7 in. Krogh centrifugal direct connected to a 7 in. by 5 in. Ohmen, vertical, marine type high speed engine. While the operating head on this pump is the height of the cooling tower plus pipe friction the static head is approximately 170 ft. on account of the cooling tower on the pump side of the valve. On the return or suction side of the pump is placed a Crane triple duty emergency valve No. 35 E for the same general purpose.

This condenser unit was designed to handle 12,000 lb. steam per hour at 26 in. vacuum. Provision was made for a duplicate unit. All piping is arranged for this addition and the tower shell placed ready to receive cooling surface, which consists of a mat of wood strips.

The condenser is above the engine room floor, and consequently much above the low pressure cylinders of the engines. The 12 in. exhaust pipe from each engine runs in a floor trench to the nearest building column and up along side of it to the main exhaust pipe which runs just under the ceiling across the engine room to the condenser.

Special provision was made for draining the condensation from the low pressure cylinder and the part

of the exhaust lines in the floor trenches and on the columns, by vertical shaft submerged centrifugal pumps, enclosed in cast iron tanks set in the floor below the bottom of the exhaust lines. These pumps and tanks drain the exhaust line when the engines are running condensing as well as non-condensing.

The discharge from these pumps may be either into the condenser shell or into the hot well, depending on whether the engines are running condensing or non-condensing. A by-pass to the sump is also provided which can be used for draining when running non-condensing. These pumps are 2 in. standard Krogh pumps and are direct connected to 3 h.p. vertical motors.

Boiler Feed Pumps.

The boiler feed pumps are two Snow horizontal, duplex outside center packed plunger pumps 10 in. by 6 in. by 10 in. each capable of feeding a maximum of 1500 boiler horsepower.

A 2 in. connection was made from the discharge of one of these pumps to supply water to operate the Lagonda boiler tube cleaner. The water supply is furnished by a 3 in. connection from the cold water House service to the suction of the pump.

Heaters and Hot Well.

Two Cochrane open type feed water heaters and receivers were installed, each with capacity to supply 1600 boiler horsepower. An auxiliary open hot well tank with oil filter was also installed. This is above the Cochrane heater so that the water flows by gravity to the heaters. All drains and returns go to the auxiliary hot well or to the Cochrane heaters should the hot well be emptied for cleaning. The feed pumps draw their supply directly from the Cochrane heaters.

Fuel Oil System.

California crude oil is used for fuel in both the power plant and kitchen ranges, one system supplying both sets of fires. The main storage tanks are under the Annie street sidewalk outside of the building line. There are seven of these tanks with a total storage capacity of 497 barrels.

By a city ordinance, tanks from which oil is fed to burners must be placed below the level of the burners, but the cost of doing so in this case was prohibitive. In order to comply with the ordinance and still leave the tanks as high as possible, an auxiliary tank was placed under the Market street sidewalk at a level lower than the burners. But the ordinance would not allow of a gravity flow from the main tanks to the auxiliary tank so a small pump room was built close up under the first floor and above the level of the main tanks. In this room are two 6 in. by 4 in. by 6 in. Worthington duplex, direct acting steam pumps for pumping the oil from the main tanks to the auxiliary tank.

The auxiliary tank has a capacity of 52 bbls. and from it the main fuel oil pumps supply the burners in the power plant and the burners in the kitchen ranges. The main oil pumping sets are in duplicate, each consisting of one 4½ by 2¾ by 4 in. duplex, direct acting pump mounted over an oil heater. Each boiler is equipped with a Witt oil regulator which regulates the main steam pressure.

Blow Off and Sump Tanks and Pumps.

The boiler blow off tanks, each 4 ft. 6 in. by 17 ft. long, are buried in the engine room floor. One tank is fitted with a Blake vertical direct acting submerged plunger pump 8 by 5¾ by 12 capable of emptying the tank into the sewer in 16 minutes. The tanks are inter-connected.

Two sump tanks are provided for the floor drainage and also to receive all trap drains that contain oil. These tanks are 4 ft. 6 in. dia. by 17 ft. long, and are buried in the floor. Each tank is fitted with a Worthington duplex vertical plunger pump size 6 by 9 by 6 capable of emptying the tank into the sewer in 4 minutes. The pumps are automatically controlled by floats in the tanks which operate quick opening throttle valves in the steam line to the pumps by a system of levers. Each tank is also connected to the 7 in. circulating water pump of the condenser outfit, which can be used to pump out the tanks in case the engine room is flooded.

Lubricating Oil Filter and Storage Tanks.

Six galvanized iron tanks, each of 1 bbl. capacity are provided for the storage of lubricating oil. A 3 in. pipe was laid from the Annie street sidewalk to the tanks for filling, so that it is not necessary to handle the oil barrels in the engine room.

A Turner oil filter with a capacity of 60 gals. per day is placed on a gallery above the storage tanks. The drains from all oil separators are pumped to this filter and after passing through the filter the oil flows by gravity to the proper storage tank. The filtered cylinder oil is used to enrich the engine oil, which is also filtered through the same filter.

Piping.

All high pressure lines for 200 lb. steam, boiler feed and blow off are extra strong, soft flanging pipe with Van Stone joints on all lines 5 in. in diameter and over. All fittings are extra heavy cast iron. All joints on high pressure lines were made with corrugated copper gaskets. Low pressure live steam lines not over 100 lb. pressure and water lines are standard pipe with cast iron fittings. Large exhaust lines are cast iron. Small lines standard wrought pipe. All steam and exhaust piping is covered with 85 per cent carbonate of magnesia canvas covered, held in place with metal bands. All drains not containing oil are piped into a header leading to the hot well and heaters. Drains containing oil are piped into a header leading to the sump.

Each boiler is fitted with automatic stop and non-return valve in addition to the gate at the main steam header. Valves are Chapman and Crane manufacture. On all high pressure steam lines, outside screw, rising stem valves were used. Valves 5 in. and over are fitted with by-pass.

All overhead steam exhaust and pump discharge piping is supported from the engine room floor by supports made of standard pipe or structural shapes, except over the boilers, where it is supported on the boiler frame work or setting. This provision was made to prevent vibration and noise reaching the upper stories of the hotel through the steel frame which would be the case if the piping was hung from the floor slab.

The main exhaust line to the condenser is fitted with a 30 in. Cochrane vacuum oil separator drained by two pumps 4 in. by 4 in. by 6 in. discharging into the Turner oil filter. The two exhaust lines supplying steam to the heating system are fitted with 14 in. and 10 in. oil separators also draining to the oil filter.

All vapor pipes and vents are in the stack compartment. The main atmospheric exhaust is 20 in. diameter made of No. 10 gauge riveted galvanized iron. It is fitted at the roof with a Burt exhaust head, the condensation being piped back to the auxiliary hot well. The main exhaust pipe is fitted with an automatic back pressure and relief valve.

ator panels, composed of blue Florentine marble, divided into three slabs, the upper slab being 20 in. high, the middle 45 in. high and the lower 25 in. high. On each of these is mounted

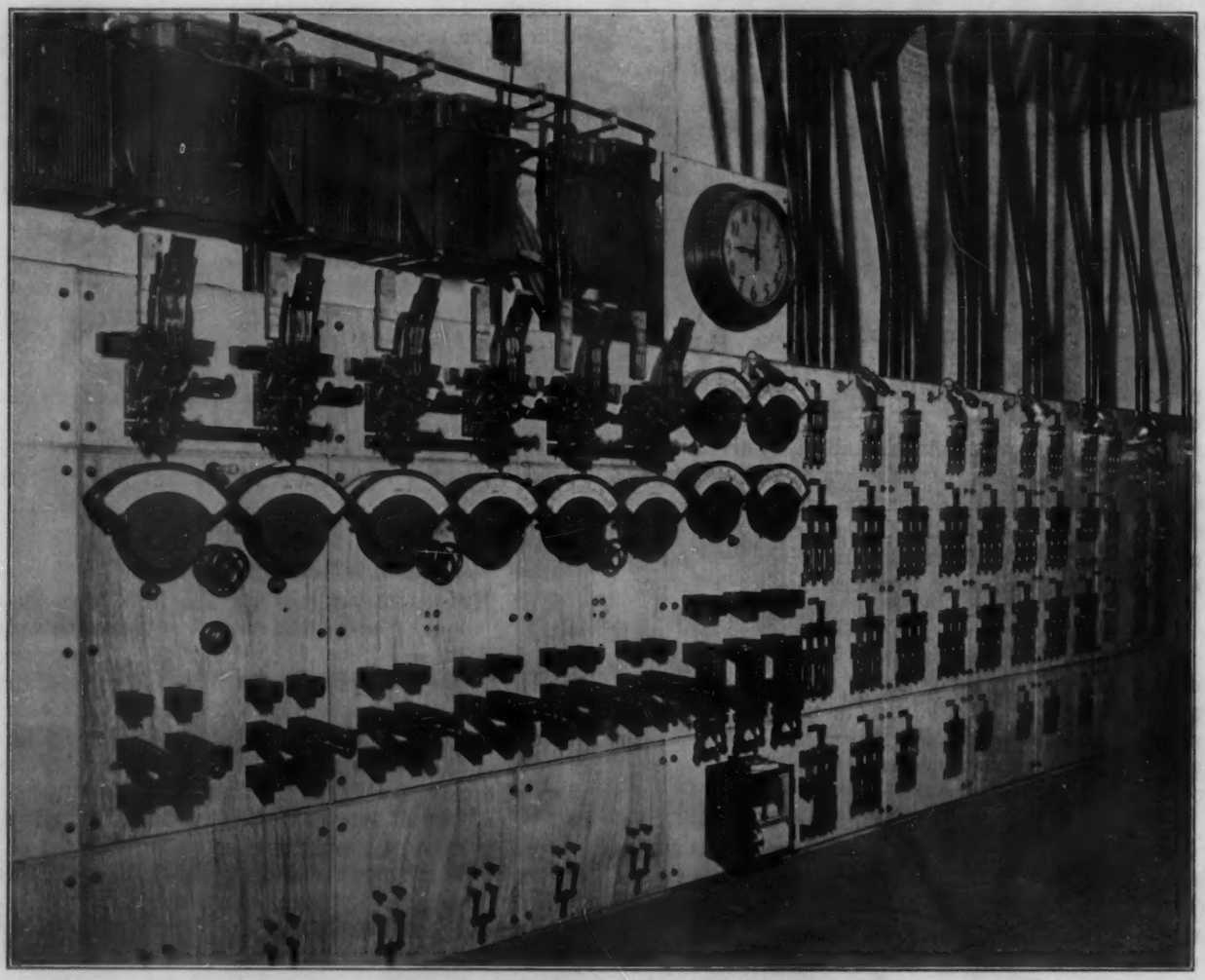
2 1500-ampere, single-pole, type "C" Westinghouse carbon circuit-breakers, each with equalizer contact. These two breakers are connected to a common cross arm, so that they may be closed independently, but will trip together.

2 2000-ampere illuminated dial type "E" Westinghouse direct-current ammeters.

1 field rheostat mounting.

1 four-point voltmeter receptacle.

2 1600-ampere two-pole double-throw knife switches.



Generator and Lighting Feeder Panels of Switchboard.

Generators.

Direct connected to each engine is a 300 k.w., 250-volt, 150 r.p.m. three-wire, Westinghouse generator. The balancing coils on the two-phase a. c. connections for balancing the load on the two sides of the 3 wire system are mounted on the engine room wall behind the switchboard.

Switchboard.

The switchboard, 45 ft. 4 in. long, divided into 17 panels each 32 in. wide, is located directly in front of the generators, as shown in the accompanying illustration, the arrangement being as follows:

Near the center of the board are the three gener-

2 100-ampere, two-pole, single-throw switches for the balance coils.

There has also been installed a fourth generator panel, which at the present time is blank, being ready for mounting the instruments when the fourth unit is installed.

On each side of the generator panels is a total load panel. The one to the right when facing the switchboard, is the total lighting load panel on which is mounted the following apparatus:

2 4000-ampere, type "E," Westinghouse illuminated dial, direct-current ammeters, to indicate the entire lighting current.

2 150-volt, type "E," Westinghouse illuminated dial, direct-current voltmeters.

3 4500-ampere, single-pole, double-throw knife switches.

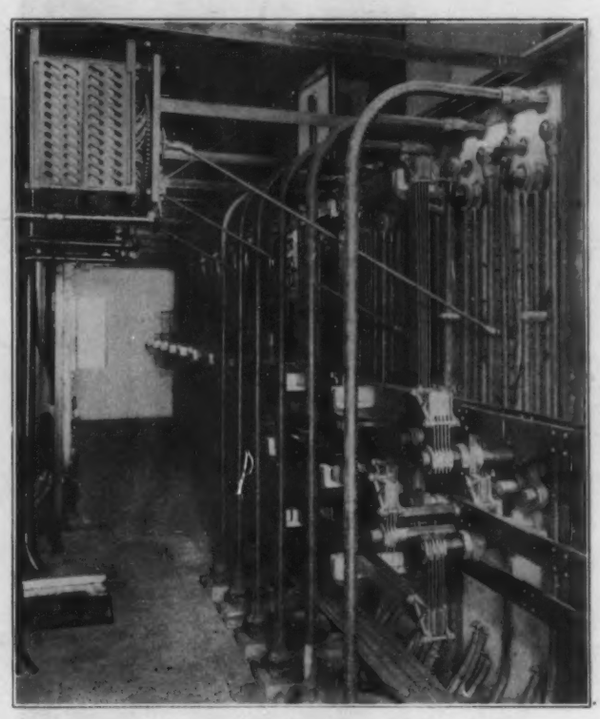
I 5000-ampere, 250-volt, three-wire, direct-current Westinghouse graphic recording wattmeter, with synchronizing attachment for attaching to the master clock circuit.

The one to the left of the generator panels is the total power load panel on which is mounted the following apparatus:

1 300-volt, type "E" illuminated dial, Westinghouse voltmeter.

1 300-0-300-volt, type "E," illuminated dial Westinghouse differential voltmeter, mounted on a swinging bracket.

1 300-volt Westinghouse illuminated dial direct-current voltmeter connectetd to the center taps of the voltmeter plug receptacle.



Back of Switchboard.

1 2000-ampere illuminated dial, type "E," Westinghouse ammeter, to indicate the entire power current.

1 six-point voltmeter receptacle.

2 four-point voltmeter plugs.

2 1600-ampere, two-pole, double throw knife switches.

1 2000-ampere, 250-volt Westinghouse, two-wire, direct-current, graphic recording wattmetetr with synchronizing attachment for attaching to the master clock circuit.

To the right of the total lighting load panel are seven lighting feeder panels. On these are placed all the switches controlling the lighting circuits throughout the building.

To the left of the total power load are two power feeder panels with switches controlling all power circuits. The two panels at the extreme left of the board are gauge panels on which are mounted 20 8½ in. dial, brass cased gauges, connected to the various apparatus in the power plant. All instruments and gauges have illuminated dials.

A 24 in. dial clock was mounted on a separate panel above the center of the switchboard. This clock together with the electric recording instruments is synchronized by the master clock.

The design of the generator panels provided for a double bus bar-system so that the lighting and power loads can be carried on separate machines. The field rheostats are mounted on the wall behind the switchboard 6 ft. above the floor and are operated from the hand wheels on the generator panels through a system of rods connected with universal joints.

Behind the switchboard is a panel on which is mounted the circuit breaker, wattmeter and fuses on the emergency service connection from the San Francisco Gas & Electric Co. All switchboard details are clearly shown by the accompanying illustrations.

Wiring.

All leads from the generators to the main switchboard are carried under the floor in ducts made by arching over trenches left in the concrete floor with thin tiles, over which the finishing surface coat of the floor was carried. From each machine 6 one million circular mil lead covered cables carry the main current to the generator panels of the switchboard.

The wiring for the lighting throughout the building is on the 3-wire 110-220 volt system with balanced load. Several two-wire 110 volt circuits are run from 2 pole double throw switches on the lighting panels for the purpose of balancing the load in case hand regulation in addition to the balancer coils is necessary.

From the panels of the main switchboard feeders run through the building to the distribution panel boards. On the typical floor there are 6 of these panel boards, one in each of the riser shafts. From these boards the individual circuits are run to the various rooms and corridor lights. A special feature in the distribution is the over-lapping of the circuits so that in general the lights in one room are supplied by more than one circuit. This is a desirable arrangement as in case a fuse blows on one circuit there will still be one or more lamps in the room on the other circuit. In actual operation this has been satisfactory.

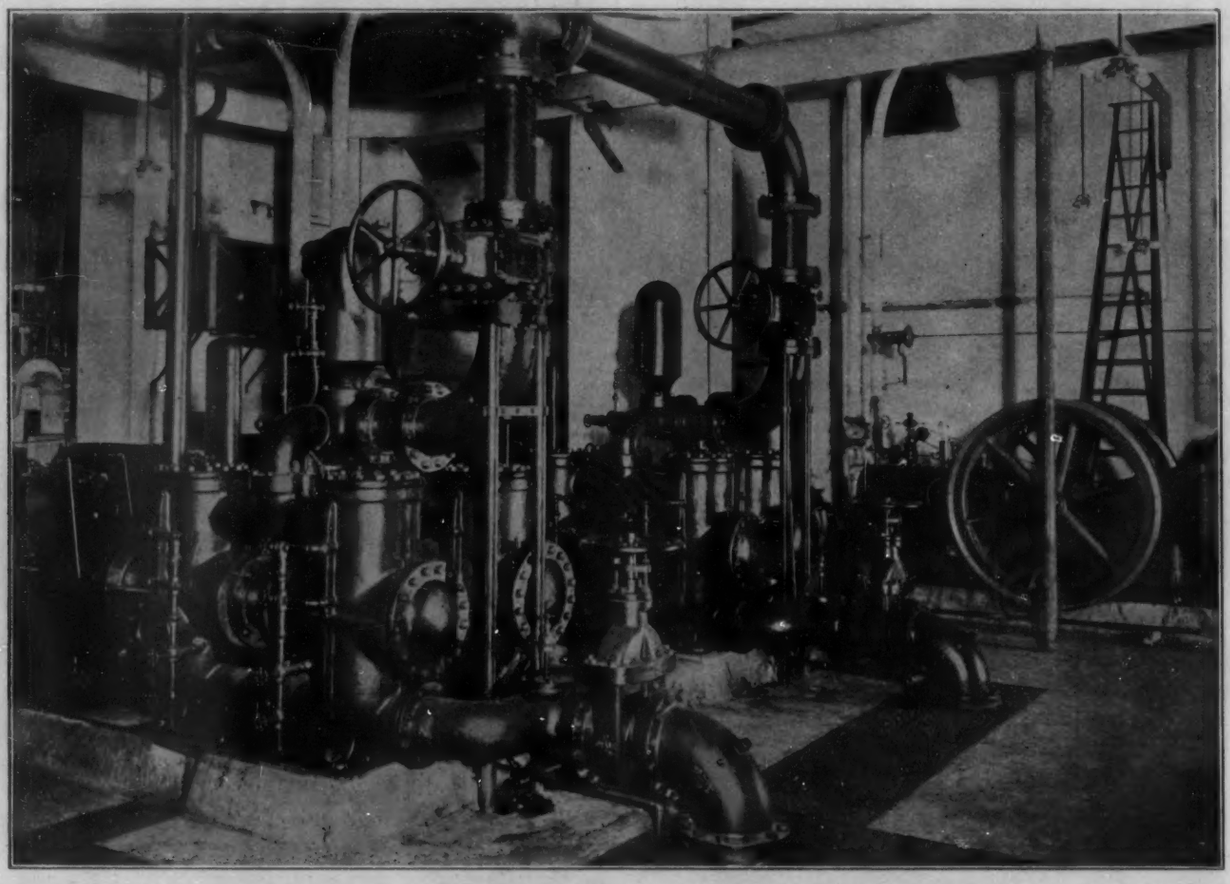
The power wiring is on the two-wire 220-volt system. The feeders were run from the power panels of the main switch board to the various load centers of distribution in various parts of the building. On these load center panels were mounted all the fused switches and starting rheostats or controllers for all the motors to which these boards distributed current.

Leads were brought to the two outside terminals of the six point voltmeter receptacle on the total power load panel from two distribution centers of the lighting system, one on the fifth floor and one on the first floor. The center terminal of the receptacle is connected to one of the voltmeters which shows the voltage at either center of distribution when the four point plug is in the proper receptacle.

In addition to the light and power wiring a complete telephone system was installed with an instrument in every room. This system is connected through a central office in the hotel with the Pacific Telephone & Telegraph Co. system. Current for the telephone system is secured from storage batteries which are charged through a rheostat which is connected to a 110-volt circuit from the main switch board.

A complete eall bell system with a push button in each room was installed to be used in case the telephone should be out of order. A Gamewell fire alarm system with 4 stations on each floor was installed. An alarm sent in from any station rings a large gong in the engineer's office and a small one in the chief clerk's office. From the latter bells on any of the floors may be rung. A clock system, with the master clock, synchronized hourly by the Western Union Telegraph Co. placed in the engineer's office, controls secondary clocks placed in all the public and service portions of the hotel.

The current for the bells, fire alarm system and clocks, is secured from a second set of storage batteries. These batteries are charged by a small motor generator set operating on a 110-volt circuit direct from the main switch board.



Elevator Pumps and Vacuum Sweeping Machine.

Pumps, Air Compressors, Water Supply.

To operate the hydraulic elevators three Laidlaw-Dunn-Gordon, compound, duplex, direct acting, center packed plunger pumps 12 and 18½ by 10 by 18 were installed. Two of these pumps are required to operate the elevators during the rush hours. Each pump is controlled by a Fisher pressure regulator set at 150 lb.

A Westinghouse locomotive air compressor, mounted on the side of the concrete column supporting the elevator pump discharge pipe, furnishes compressed air at 150 lb. pressure for charging the elevator pressure tanks and the air chambers on the pumps.

Two Laidlaw-Dunn-Gordon duplex direct acting center packed plunger pumps 12 in. by 8 in. by 10 in. were installed for the cold water supply. Four pressure tanks each 7 ft. 6 in. diameter by 40 ft. 0 in. long were installed. One pair of these operates under 40 lb. pressure and supplies water to the basement and first to the fifth floors inclusive, the other operates under 80 lb. and supplies the sixth to ninth floors inclusive. Both pumps are operated continuously, one on the 40 lb. sytem, the other on the 80 lb. system. Each is fitted with a Fisher pressure governor. These pumps are cross connected so that either may be operated on the high or low pressure system or one pump only can be used in which case it would operate at 80 lb. and supply the low pressure system through a reducing pressure valve.

Two 14 in. by 7½ in. by 12 in. duplex Worthington Underwriter fire pumps were installed. In order to keep these pumps in working order, they are used on the hot water system of the hotel, one on the low pressure supplying the kitchen, laundry and basement and first floor and the other on the high pressure supplying the second to ninth floors inclusive.

These pumps are equipped with pressure regulators for controlling the pumps when they are working on the house system. Each regulator has a full sized by-pass so that it can be cut out in case of fire.

Two 7½ in. by 8 in. by 9 in. crank and fly wheel air compressors were installed, each with a capacity of 72 cu. ft. of free air per minute at 100 lb. pressure,

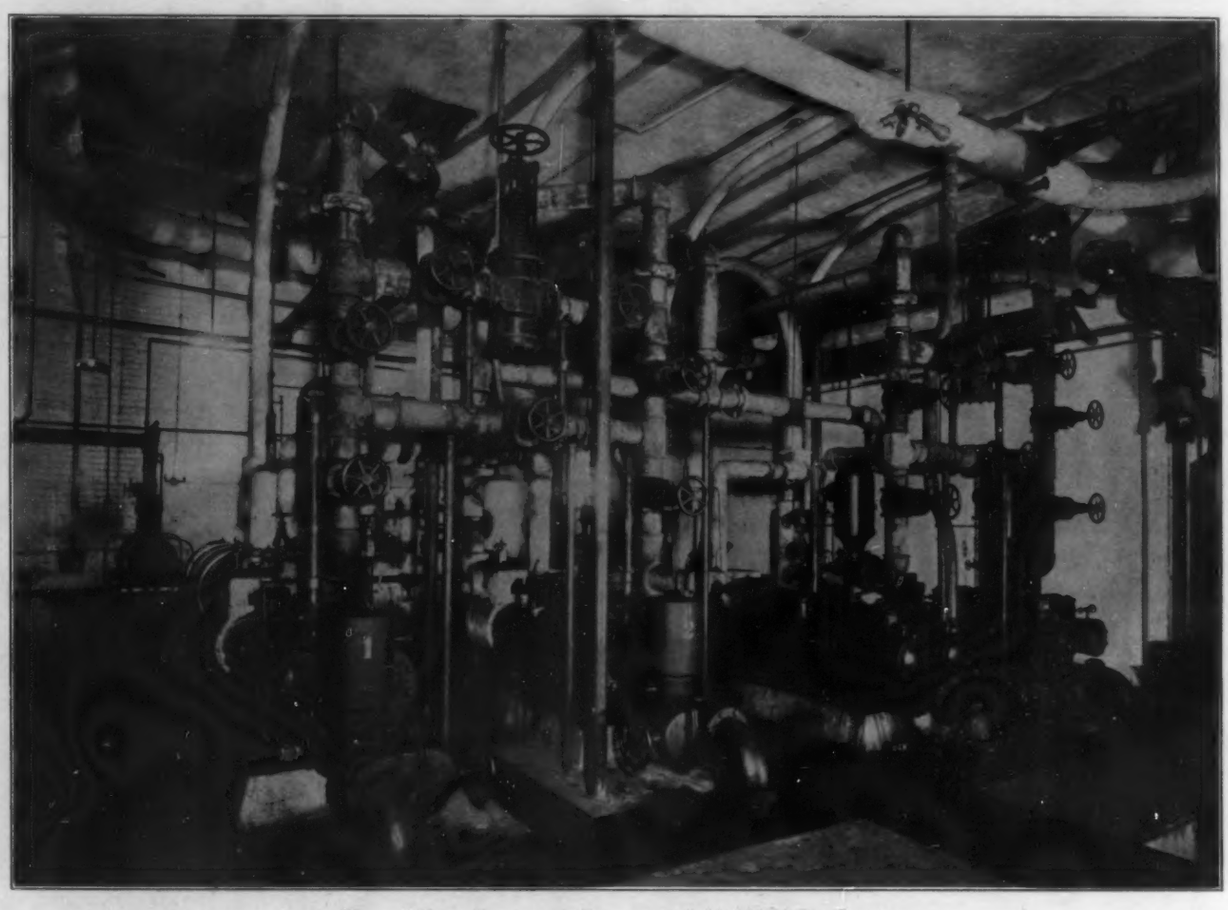
to furnish compressed air for charging the hot and cold water storage tanks, for washing the water filters, for pumping the two deep wells, and for the compressed air nozzles used for blowing dust out of the electrical machinery.

Two driven wells are sunk in the basement of the hotel, one in the ice machine room and one in the laundry. These are each 14 in. diameter, 220 ft. deep. The water level in these wells stands, when not pumping, 20 ft. below the basement. These wells are pumped by an air lift system, air being supplied to the wells at 60 lb. pressure by the above mentioned compressors.

The discharge from the air lift system is into the large brick tank located under the main court. The piping is so arranged, however, that at the time the water softener is installed the discharge will be directly into the tanks of the softening plant and after passing through the softener will go to the above mentioned court tank.

This court tank is a brick tank 100 ft. by 57 ft. by 17 ft. deep and has a capacity of 600,000 gallons. At the present time this tank is used for the storage of well water and also rain water collected on the roof. The well water, owing to its hardness, cannot be used without softening, except for flushing purposes. However, pending the installation of a water softener plant, it is being used in the hot water system of the hotel but not for boiler feed water.

In addition to this storage tank, there are two filtered water storage tanks, one located under the engineer's office and the other in the Market and New Montgomery street corner of the engine room. The first of these is 16 ft. in diameter by 9 ft. 6 in. deep with a capacity of 14,000 gallons. The second has a diameter of 10 ft. and is 8 ft. 6 in. deep with a capacity of 5000 gallons. The tops of these tanks are set at the same elevation, the bottoms being cross connected with 10 in. pipe. The house supply is drawn from these tanks and pumped to the four storage pressure tanks. By the installation of these pressure storage tanks and also all other storage tanks in the basement, it was not necessary to place any tanks on the roof, so that no water load is carried on the building columns in addition to the dead load of the building.



Fire and House Pumps. Air Compressors behind No. 1 Fire Pump.

On the inlet side of the house heaters and connected to the returns and the make-up of the house hot water system is a riveted steel tank 4 ft. 3 in. in diameter by 10 ft. 0 in. long with a capacity of 1060 gallons. This acts as a storage reservoir for hot water and is also a mixing tank for the hot water make-up.

Two Goubert vertical closed hot water heaters are used for heating the water supplied to the house; one of these furnishes a supply to the basement, kitchen and laundry and has a capacity of 100 gallons per minute from 60 degrees to 200 degrees plus; the other has a capacity of 200 gallons per minute from 60 to 190 degrees. These are supplied with exhaust

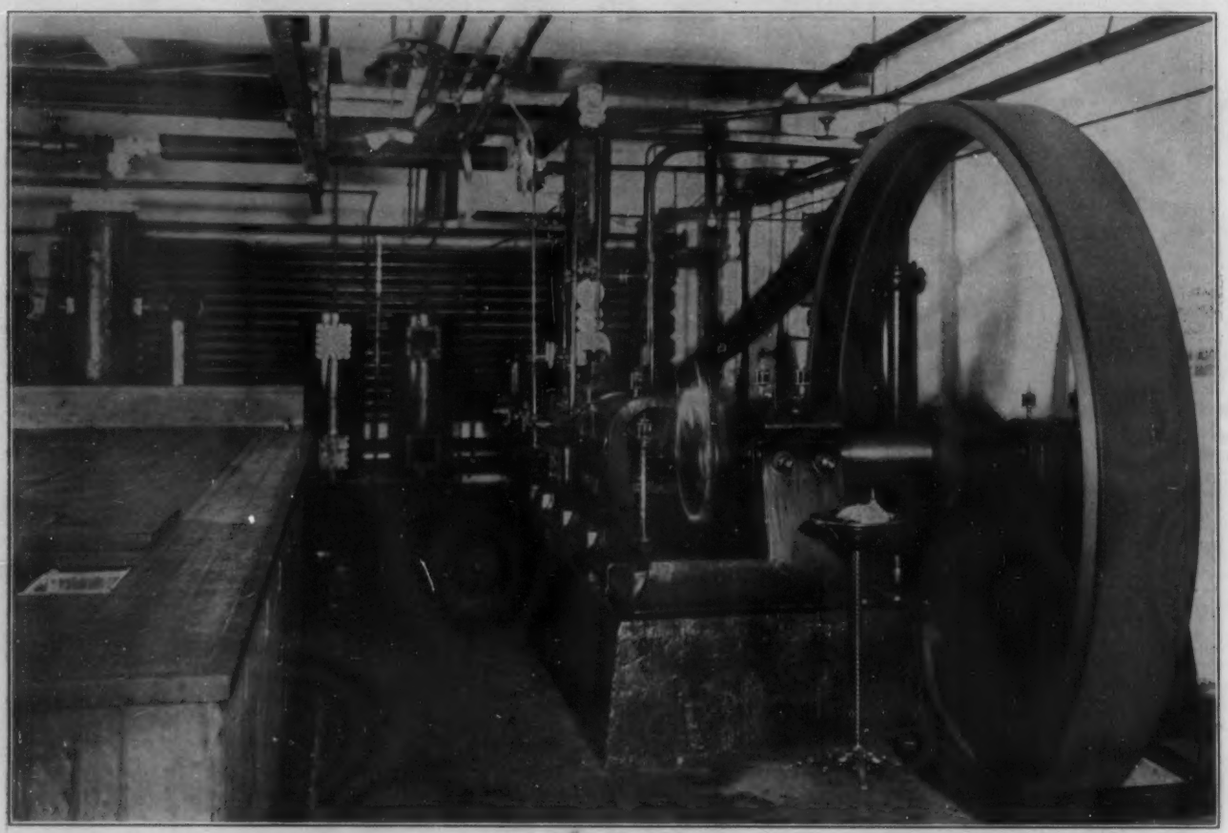
steam from the exhaust loop running around the basement. The steam connection to each is fitted with a Johnson thermostatic valve controlled by a hot water thermostat in the hot water discharge of each heater. These thermostatic controls were installed in order to control the temperature of the water and prevent it from becoming so hot as to damage the plumbing fixtures.

Two open gravity rapid sand filters were installed in the filter room under the Market street sidewalk. The filter tanks are reinforced concrete each 7 ft. 10 in. by 10 ft. 0 in. Each filter was designed to filter a maximum of 226,000 gallons every 24 hours, which is at the rate of 125,000,000 gallons per acre per day, or 2880 gallons per sq. ft. per day. The water supplied to the hotel is taken from the Spring Valley main on New Montgomery street, passes through a battery of eight 2 in. Neptune meters, thence through a 6 in. Venturi meter to the filters. From these it is discharged into the open, filtered water tanks mentioned above.

This Venturi meter is equipped with a Type "M" combined indicator and chart recorder which gives a graphic record of the rates of flow through the meter. By adjusting the valves on the supply pipe any rate of flow can be maintained so that the filters will work at a uniform rate. As the consumption of water throughout the house varies the open filtered water storage tanks serve as equalizing reservoirs.

The filters were installed by the Continental Jewel Filtration Co. and are equipped with their patent strainers. The effluent pipe is fitted with an automatic float valve closing off the filters in case the filtered water storage tanks should be full. These filters are equipped with continental Jewel air washing system, compressed air being furnished through a reducing valve from the two compressors at 4 lb. pressure. On account of the location of the filters below the sewers, the wash water of these tanks is piped to the 7 in. centrifugal circulating pump, which lifts the wash water into the large sewer on Market street.

Plans have been prepared for a water softener plant to be located in the New Montgomery street end of the engine room. This is to be arranged so that the overflow will pass directly into the court tank, which will then be a softened water reservoir from which boiler feed water and hot water house supply will be taken.



Refrigerating Plant.

Refrigeration and Ice Making.

The ice making and refrigerating plant is in a special room and includes one 35-ton horizontal double acting Vulcan motor driven ammonia compressor, double pipe ammonia condensers, ammonia system complete, 6-ton ice making and cooling tank, etc. The brine is circulated through the room coils by two steam brine circulating pumps.

There was also installed machines for preparing the ice for various departments, including saws for making cubes for drinking water, ice crusher and ice shaver. These machines are all driven from a jack shaft by a 3 h.p. motor.

There are thirty six different cold storage rooms and refrigerators placed in various parts of the basement, kitchen and bar room to suit the convenience of

the various departments. There are also three ice storage rooms, having a capacity of 50 tons.

The construction of these rooms in general includes sheet cork insulation, tile walls and floors, plastered ceilings, oak doors and trimmings, bronze nickel plated hardware throughout, and galvanized iron shelves, racks and drawers. The designs were carefully worked out so as to include as little wood as possible, in order to secure a durable and sanitary construction.

The rooms and refrigerators are cooled by circulating cold brine through coils of galvanized pipe arranged in coil lofts. Each room is provided with a separate regulator so that the temperature may be varied to suit special conditions.

The ammonia compressor is driven by a 50 h.p. variable speed motor, with a speed variation from 225 to 450 r.p.m. This wide variation of speed requires that the motor have interpoles or commutating poles, in order to furnish satisfactory operation over the whole range of speed. The motor is also compound wound in order to give the heavy starting torque required at starting the compressor.

In order to prevent excessive pressure on the ammonia system a special controller was installed on the motor control panel. This consists of a Cutler-Hammer solenoid switch, the magnetizing current of which passes through a pair of contacts which are held in place by a spring latch. Excessive pressure will release this latch through the action of a special Vulcan diaphragm controller, thus interrupting the magnetizing current, releasing the solenoid switch and stopping the motor. On account of the size of the machine, it was not equipped with an automatic starter in case the pressure should run down, as it was desired that the attendant ascertain the cause of the excessive pressure before the machine could be again started.

Vacuum Sweeper.

A complete vacuum sweeping and scrubbing system was installed with outlets on all floors. The vacuum pump is located in the main engine room near the elevator and fire pumps. It is a Vacuum Engineering Company machine and has a capacity for operating eight sweeping nozzles at one time. On the first floor and basement provision is made so that the scrubbing water may be supplied through the hose and implements and by reversing a valve the water may be drawn back through this system and discharged into the sewer. This system operates without separating tanks of any kind and all dirt is discharged automatically to the sewer.

Heating and Ventilating.

The upper floors of the hotel are heated by direct radiation, steam being circulated by the Wade vacuum system. Under each window is placed a radiator enclosed in a galvanized iron lined recess under the window sill. A large bronze grill was placed in the baseboard and another in the window sill to allow the air to circulate across the radiator. A removable panel the same size as the recess allows access to radiator for cleaning and adjusting. The steam supply to the radiators is controlled by valves having extra long stems passing through the casing with the hand wheel outside.

Exhaust steam is carried to the pent house floor by two 7 in. risers and one 8 in. riser, which connect to a large main running entirely around the building in a pipe space immediately under the roof. Drop lines from this main supply steam to the radiators on all floors. These drop lines are anchored at the fifth floor. Returns parallel the steam lines, being connected to the radiators through Wade vacuum valves. The lower ends of all steam lines are drained through vacuum valves.

The space between the skylights over the main court, the ladies' dining room, the concert room, the bar, the barber shop, and over the corridors was fitted with steam coils automatically controlled by thermostats located in the rooms beneath for the purpose of keeping the space between the skylights at an even temperature and preventing down drafts from the cold glass during cloudy days or at night.

In the engine room are two 6 in. by 10 in. by 12 in. Marsh direct acting steam vacuum pumps. All returns are brought to a Wade condenser with a water jet for cooling. The suction of each vacuum pump is connected to this condenser from which the condensed water and air is pumped and discharged into the hot well. These pumps are designed so that either pump can maintain from 5 in. to 10 in. vacuum on the entire heating system.

The basement and first floor, containing all the public rooms, are heated by the indirect system with the addition of a few direct radiators under the windows in the stores on Market and New Montgomery streets and also in the vestibules at the various entrances.

The main fresh air fan room is in the basement and contains the four fans supplying fresh air to the engine room, the men's grill, the bar and the barber shop, the north half of the main court, the ladies' dining room, the south half of the main court and various public offices, the help's kitchen, laundry and other service portions of the basement.

Fresh air is brought into this room by two shafts each 7 ft. by 12 ft., taking the fresh air from the space above the main court. Across the bottom of each of these shafts is an air washer, the one on the north side having a capacity to wash 53,000 cu. ft. of air per minute, and the one on the south side having a capacity to wash 46,000 cu. ft. per minute. These washers are equipped with spray nozzles, water being supplied by two motor driven centrifugal pumps. The air passes through the water screens and then through a series of eliminators which remove all suspended moisture. The outlets of the air washers are directly connected to the inlets of the fans, the tempering coils being set in these ducts.

In another fan room in the basement are three exhaust fans, one exhausting the engine room, the second exhausting the men's grill, bar and barber shop and the third the laundry.

In a third fan room is the exhaust fan exhausting the pastry, bakery, butcher shop and other service portions of the basement.

On the mezzanine floor in a separate room is the exhaust fan which exhausts the air from under the kitchen hood and also from under the hood of the grill

in the men's dining room. The discharge of this fan is especially heavy riveted iron duct in the main stack compartment 24 in. by 36 in. running to the roof. The duct from the main kitchen hood is heavy riveted iron No. 10 gauge, covered with asbestos. This fan is by-passed, the by-pass damper being held closed by a fusible link. In case the grease should burn in the duct, this by-pass will open and a damper on the fan inlet close, allowing the hot burning gases to pass directly up the discharge duct to the roof, without passing through the fan.

In a second fan room on the mezzanine floor, is the main kitchen exhaust fan, and the fan for exhausting the concert and reception rooms.

In a third room on the mezzanine floor, is the main kitchen supply fan; also the supply fan for the concert and reception rooms along the Jessie street side of the hotel. The exhaust and supply fans for the banquet and ball room are also placed in this fan room. The fresh air shaft taking the air from the space above the main court is in the south end of this room. Across the end of this is another air washer complete with nozzles and eliminator plates. The fresh air fans in this room are not directly connected to the outlet of the air washer but the entire room is used as a washed air chamber. Each fresh air fan in this room is fitted on its inlet side with heater coils.

In five fan rooms on the pent house floor are located the exhaust fans which exhaust the bath rooms. One of these fans is also connected to the hood in the helps kitchen in the basement. All of these pent house fans discharge the foul air through louvered openings in the roof.

All fans are direct connected to Westinghouse slow speed motors of the size and speed shown on the following table; which also shows the size and capacity of all fans.

PALACE HOTEL FANS.

Rooms Supplied	cu. ft. per min	No. of housing in.	Dia. of wheel	R.P.M.	H.P. of Motor
Service part of basement	20,000	110	66	240	6¼
Ladies' dining room, court, offices	26,000	110	66	240	9
Men's grill, court, bar room, barber shop	25,000	110	66	240	9
Engine and boiler room	28,000	120	72	220	10
Banquet room	17,000	100	60	265	6
Concert room, reception rooms	15,000	100	60	265	5
Kitchen and pantries	16,000	100	60	265	5
Rooms Exhausted					
Service part of basement	18,000	110	66	240	6
Ladies dining room, court, grill, bar, barber, offices	45,000	140	90	180	15
Laundry	11,000	90	54	290	4
Engine and boiler room	28,000	120	72	220	10½
Banquet room	21,000	110	66	240	6½
Concert and reception rooms	17,000	100	60	265	6
Kitchen and pantries	20,000	100	60	290	6
Kitchen hood	12,000	70	42	550	10
Bath rooms and helps' kitchen	21,000	110	66	240	6¼
Bath rooms	14,000	80	48	330	4½
Bath rooms	12,000	80	48	330	4
Bath rooms	8,000	60	36	440	2½
Bath rooms	15,000	100	60	265	5

All fans are American Blower Co.'s fans with full steel housing. All motors are equipped with Cutler-Hammer speed controllers of the fan type with speed regulation of 100 per cent to 50 per cent of full speed.

All temperature control is by thermostatic valves on the steam inlet to the heater coils. These are operated by thermostats placed in the various rooms supplied by the fans.

All duct systems throughout the building are single duct as, on account of the large area of the building the large size of rooms and the large amount of air required, the cost of a double duct system would have been prohibitive.

In general, the fresh air is admitted to the room about 12 ft above the floor line. In the two grill rooms fresh air registers are located over the doors. The fresh air inlets on the Annie and Jessie street side of the ballroom are long narrow ones built in the sides of the window casings, the warm air blowing out across the windows to prevent cold drafts from the large glass surfaces. On the inside wall of the ballroom the fresh air is brought in over the doors. As smoking is allowed in all of these rooms, the exhaust registers were made long and narrow, running from a point about 30 in. above the floor to a point 12 ft. above the floor, in order to clear the room of smoke without drawing it down to the floor line. In actual practice this long exhaust register works very satisfactorily.

The amount of air exhausted from the main court is much less than the supply, while that of the two grill rooms on each side of the court is much greater than the supply. By this distribution the exhaust fans draw air into the grill rooms from the main court, thus preventing any odors from getting into the court and lobby.

The main kitchen supplies are brought in through down spouts directly over the space between the serving table and the front of the ranges. Fresh air inlets were also provided along the north wall of the kitchen. The main exhaust from the kitchen is taken out under the hood over the range and through exhaust outlets placed in the ceiling. The kitchen exhaust is 100 per cent in excess of the supply. This proportion insures that no odors from the kitchen will reach the grill rooms or the main court which connect to the kitchen through the serving pantries. The air in the kitchen and pantries is changed every 2½ minutes. In the actual operation of the kitchen the tendency of all serving doors is to swing open toward the kitchen.

The hood over the grill in the men's grill room is connected to the kitchen hood exhaust fan. An additional exhaust duct is run from the space directly over this to the main stack compartment. As the temperature of this stack compartment is at all times greatly in excess of the room temperature, the whole stack compartment acts as a natural draft exhaust.

In order to keep the floor of the grill, bar and barber shop cool two false ceilings were built over the engine and boiler room which occupy the basement directly under the above named rooms. Between these ceilings is in an air space varying in height from 18 inches to four feet. The main cold air supply duct to the engine and boiler room runs in this space over one edge of the engine room and furnishes air to the room through openings in the ceiling directly over the generators and the pumping equipment. Outlets from this duct were left into the space between the two ceilings to furnish a constant supply of cold air to this space. The exhaust duct for the engine and boiler room runs along the room on the opposite side from the supply duct and exhausts the hot air from directly over the rear end of the boilers. Openings are also

provided into this duct for exhausting the air from the space between the ceilings. Thus cold air is admitted to this space on one side of the room and is circulated across the room to the opposite side and exhausted. This constant circulation of cold air has proved very effective in keeping the floor above the boilers cool. This space also acts as a deadener, preventing the noise of the oil burners and machinery from reaching the rooms above. All electrical conduits ventilating ducts, heating and plumbing pipes were run between the two ceilings. All power plant piping is below both ceilings for convenience in reaching the valves.

The exhaust register for each bathroom is placed in the center of the ceiling. A bronze grill was placed in the bottom of the door connecting the sleeping room with the bathroom to allow air to pass from the room to the bathroom. The bathroom system is proportioned to change the air once every five minutes in each bathroom. As all sleeping rooms are nearly of the same size, this rate for the bathroom corresponds to a change of air in the bedroom once every 30 minutes.

All branch ducts from the bathrooms are connected into a large duct running in the furred ceiling over the corridors, these ducts being connected to vertical ones in the five shafts, which run to the pent house. Over the top of each of these shafts is placed a full housing steel plate fan with discharge through a louvered opening above the roof. Each bathroom connection is equipped with a sliding damper which was set before the register faces were placed, so as to insure an equal distribution of the air through all the branches.

All of the branches of the fresh air ducts are also equipped with adjustable dampers which were set so that all air outlets receive their proper proportion of the total amount of air carried by the main duct. Behind the register faces of all fresh air and exhaust outlets a series of baffle plates were installed to insure an even distribution of air over the entire register face. In public rooms of the building the register faces are composed of ornamental iron or plaster behind which are placed brass screens of ¼ in. mesh. All register faces were of special design to conform to the scheme of the interior decorations.

All fresh air ducts carrying heated air are covered with a one-inch covering of asbestos wrapped with canvas.

The specifications for the ventilating work called for fans capable of delivering the quantities of air specified in the above table. A series of tests were made on each and every fan to determine whether the fans were delivering the specified amount of air. During these tests the air delivered by the fan was measured with a Pitot tube inserted in the inlet or discharge connection to the fan, depending on whether a supply or exhaust fan was being tested. These tests showed that all fans were delivering the amount of air required and in most cases much more than that specified.

To insure silent operation of all motors and fans which were placed directly on the floor slab of the mezzanine and pent house floors a layer of one inch sheet cork was inserted between the fan base and the floor. The connections to the inlet and outlet of all fans were made by flexible joints of heavy canvas, reinforced with light screen, to prevent vibration from being communicated to the ducts.

Elevators.

The elevator equipment of the building consists of five passenger elevators running from the first floor to the eighth; one service elevator running from the basement to the eighth; two service elevators running from the basement to the ninth floor; also two lifts, one from the basement to the sidewalk and one from the basement to the kitchen. The passenger elevators are geared for a speed of 400 ft. per minute and the service for 350. These eight machines are rope driven of the horizontal type, the machinery being located in the basement. The two short rise elevators are of the plunger type. The passenger elevators are all equipped with automatic air operated doors. All elevator equipment except the pumps was installed by the Otis Elevator Co. of New York and San Francisco.

The architects for the building were Trowbridge & Livingston of New York. All of the plans were drawn in their San Francisco office under the direction of Mr. Geo. W. Kelham, a member of the firm.

The entire mechanical equipment of the hotel was designed by Hunter & Hudson, consulting engineers, San Francisco, Cal., and was installed under their supervision.

CONDENSED DATA OF PALACE HOTEL EQUIPMENT

Apparatus.	Make.	Contractor.
Boilers	Babcock & Wilcox.	C. C. Moore & Co.
Engines	McIntosh & Seymour.	C. C. Moore & Co.
Power Plant Piping		C. C. Moore & Co.
Stack and Breeching		C. C. Moore & Co.
Generators and Motors	Westinghouse.	Westinghouse E. & M. Co.
Switchboard		J. G. Sutton Co.
Electric Wiring. Telephone Wiring		J. G. Sutton Co.
Clock, Bell and Fire Alarm Systems		J. G. Sutton Co.
Condenser Equipment and Cooling Tower	Wheeler.	C. H. Wheeler Mfg. Co.
Elevator and House Pumps	Laidlaw-Dunn-Gordon.	H. R. Worthington Co.
Fire Pumps	Worthington.	H. R. Worthington Co.
Ventilating Fans	American Blower Co.	A. B. Co.
Indirect Heating and Ventilating		Robt. Dalziel Jr. Co.
Direct Heating	Wade.	Mangrum & Otter, Inc.
Air Compressors and Air Lift	Compressed Air Machine Co.	Compressed Air Machine Co.
Water Filters	N. Y. Continental Jewell.	Cal. Jewell Filter Co.
Refrigerating Plant	Vulcan.	Vulcan Iron Works.
Sump and Blow-Off Tanks. Oil Tanks		Risdon Iron Works.
Elevators	Otis.	Otis Elevator Co.

NEW ELECTRICAL DEFINITIONS.

The Standards Committee of the American Institute of Electrical Engineers has submitted a number of proposed amendments to the Standardization Rules of the Institute. Many of these amendments involve slight changes in the wording of present definitions, the following list being that of the more important additions.

A Compensated Alternator is an alternator which automatically compensates for the drop in voltage in its armature, or in its armature and the line.

A Synchronous Compensator is a synchronous machine, running either idle or under load, whose full excitation may be varied so as to modify the power-factor of the circuit, or through such modification, to influence the voltage of the circuit.

An Inductor Alternator is an alternating-current generator in whose armature windings the field magnetic flux pulsates but never reverses.

An Induction Generator is a machine similar to an induction motor but driven as an alternating-current generator.

A Rotor is a rotating member of a machine.

A Stator is a stationary member of a machine.

Equalizing Rings are rings connected to equipotential points of multiple-wound armatures to equalize the voltage between brushes.

A Primary Winding is that winding of an induction motor or of a transformer which receives power from an external source.

A Secondary Winding is that winding of an induction motor or of a transformer which receives power from the primary by induction.

Note: The terms "High-tension winding" and "Low-tension winding" are suitable for distinguishing between the windings of a transformer where the relations of the apparatus to the source of power are not involved.

A Transformer-Balancer is an auto-transformer for dividing a voltage in constant proportions, and usually into two equal portions.

An Induction Starter is a device used in starting induction motors, converters, etc., when they are started by voltage control, consisting of an auto-transformer in connection with a suitable switching device.

A Leakage Reactance is that portion of the reactance of any induction apparatus which is due to stray flux.

A Synchronoscope is a synchronizing device which, in addition to indicating synchronism, shows whether the machine to be synchronized is fast or slow.

A Voltmeter Compensator is a device used in connection with a voltmeter to reduce its reading by the amount of the line drop, and thus causing it to indicate the voltage delivered at the distant end, or at any other predetermined point of the line.

A Watthour Meter is an instrument for registering total watthours. This term is to be preferred to the term "integrating wattmeter."

Recording Wattmeters, Recording Voltmeters, Recording Ammeters } are instruments which record upon a time-chart the values of the quantities they measure.

b. Indicating Meters should be rated according to their full-scale reading of volts, amperes, or watts (at unity power-factor in wattmeters).

c. Watthour Meters should be rated by their power delivery at rated volts and amperes at unity power-factor.

CHANGES MADE IN THE AREAS OF CALIFORNIA NATIONAL FORESTS.

The President signed proclamations effective July 1, 1910, eliminating 65,490 acres from, and adding 9,389 acres to, the Sequoia National Forest, California, transferring 175,730 acres from the Sierra National Forest to the Sequoia, and establishing the Kern National Forest by the division of the Sequoia. The areas excluded by the Sequoia proclamation are scattered along the west boundary of the Forest and are lands which, upon a very careful examination made by the Secretary of Agriculture last summer, were found to be not chiefly valuable for National Forest purposes. They comprise areas lying north and east of Squaw Valley, southeast of Aukland, northeast of Lemon Cove, and west of White river.

The additions to the Sequoia are located along the western boundary and consist of scattered tracts which were found to be best adapted to forest uses and watershed protection. The main areas added lie northwest of Milo and northeast of Daunt.

The area transferred from the Sierra to the Sequoia comprises that portion of the watershed of the South Fork of Kings river which lies north of the river. The entire watershed of the South Fork of Kings river is thus now within the Sequoia Forest. The area of the reduced Sequoia Forest is approximately 1,261,043 acres, and that of the Sierra approximately 1,759,950 acres.

The new unit to be known as the Kern National Forest has an area of approximately 1,951,191 acres and comprises that portion of the old Sequoia Forest lying east of Kern river and south of the north boundary of Kern county. The headquarters of the new Forest will be located at Bakersfield. The unappropriated portions of the areas eliminated by this proclamation will be restored to settlement and entry after having been advertised in the local papers by the Secretary of the Interior.

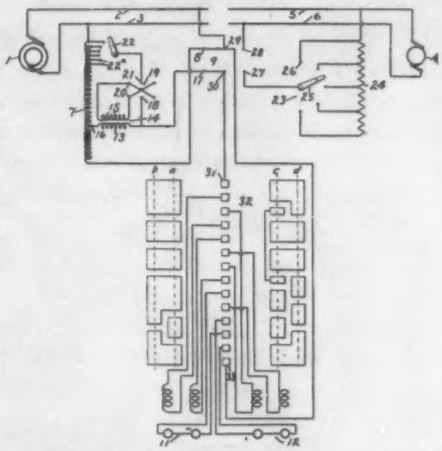
BOOKS RECEIVED.

Miscellaneous Tests of Electric Car Equipment. By Eugene C. Parham and John C. Shedd; 153 pages; 5x7½ inches; 73 line cuts. McGraw-Hill Book Co., New York, and Technical Book Shop, San Francisco. Price, $1.00.

The present volume is the second of two, the first being entitled "Shop Tests on Electric Car Equipments." The second volume supplement contains directions for both stationary and motion tests. Rules are given for testing car fuses, circuit breakers and controllers. A number of miscellaneous tests, such as speed, acceleration, retardation and horse power required are presented. The concluding chapter gives illustrated directions for reviving shocked persons and relieving burns. To anyone engaged in work of this character this book is invaluable.

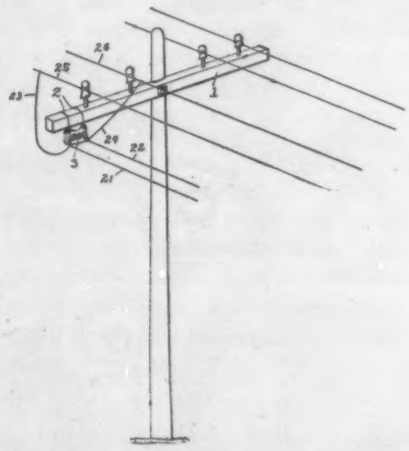
PATENTS

964,658. Method of Operating Electric Motors. Benjamin G. Lamme, Pittsburg, Pa., assignor to Westinghouse Electric & Manufacturing Company, a corporation of Pennsylvania. The method of operating electric motors having armature and field magnet windings which consists in supplying alternating currents to the motors so that only a portion of the total amount of current traverses each of the field magnet windings, and the total amount traverses the armature windings



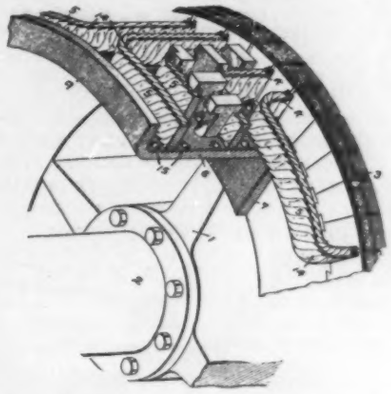
for the lower speeds, then in supplying the current so that only a portion of the total amount traverses each of the armature windings for the higher speeds, and in supplying direct current to the motors so that the total amount of current traverses the field magnet and armature windings for the lower speeds and only a portion of the total amount traverses each of the windings for the higher speeds.

964,737. Insulated Distributer for Electric Service-Wires. John B. Ashley, Seattle, Wash. In a wire distributing support, an insulating casing entirely surrounding the support,



a plurality of divisions carried by the casing and the support and adapted to receive a plurality of wires, and means engaging the casing surrounding the support and adapted to support both the casing and the support.

964,630. Dynamo-Electric Machine. Joseph P. Feeney, Schenectady, N. Y., assignor to General Electric Company, a corporation of New York. In a dynamo electric machine, a rotatable member, coils therefor having end turns or connections, a support for said end turns, and means for holding each of said end turns in place against centrifugal force comprising a plurality of members arranged in a row, each of said members having one or more flanged portions, each of

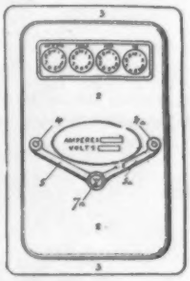


said flanged portions engaging the exterior surface of a single end turn, and a single stem portion passing between the end turns and secured to said support, said members being spaced apart about said support.

964,963. High-Pressure Turbine-Pump. Walter L. Forward, West Berkeley, Cal., assignor to Byron Jackson Iron Works, West Berkeley, Cal. In combination with a turbine pump, the guide vanes forming fluid passages therein and

having outwardly projecting segments, of shells and covers having corresponding annular grooves into which the segment project, said grooves being undercut and having depressed pockets at intervals, and a filling of fusible packing metal cast into the grooves around the segments.

964,681. Meter-Lock. Isaac W. Norcross, New York, N. Y. In a meter lock, a fixed base having a removable incasement with threaded studs projecting from said base and through



said incasement, in combination with adjustable lock arms engaging said projecting studs and having interlocking ends with openings to admit a soft metal seal at an intermediate central point.

JOURNAL OF ELECTRICITY
POWER AND GAS

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E. B. STRONG, President
A. H. HALLORAN, Vice President and Managing Editor
C. L. CORY, Secretary.
DIRECTORS
R. J. DAVIS A. M. HUNT A. H. HALLORAN C. L. CORY E. B. STRONG
604 MISSION STREET, SAN FRANCISCO

EASTERN OFFICE, 150 NASSAU STREET, NEW YORK
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Changes of advertising copy should reach this office *ten days in advance of date of issue.* New advertisements will be accepted up to noon of Monday dated Saturday of the same week. Where proof is to be returned for approval, Eastern advertisers should mail copy at least thirty days in advance of date of issue.

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FOUNDED 1887 AS THE
PACIFIC LUMBERMAN, CONTRACTOR AND ELECTRICIAN

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The next issue of the Journal of Electricity, Power and Gas, August 6, will contain a complete illustrated description of the system of the Northern California Power Co., written by Rudolph W. Van Norden.

The Power of Money

We often speak figuratively of the power of money without a full appreciation of the literal aptness of this expression. Adopting the hydraulic analogy, the stream of coin that is poured forth each year from the mints may well be likened to a stream of water fed from the clouds. Both run to waste unless properly conserved and controlled so as to perform useful work. Whether stored in mountain reservoirs or in bank vaults, their energy is but potential until the gates have been opened and these quantities are set in motion by some such force as the attraction of gravitation or of interest. It may seem novel to think of interest as a force, but in the power equation of money it is invaluable. It is much like gravity, in that its effect is greatly accelerated when compounded. Conducted through the proper channels, it is money that keeps the wheels of industry in motion, and so in time money thus becomes power.

Judging from the press dispatches of this week, the supply has been shut off from the pipe lines leading to the stock and bond market. Divers reasons are assigned for the undeniable evidence that many good securities are a drug on the market. Stocks that will pay six or seven per cent on the present investment move but slowly. Such sluggishness may partly be accounted for by the lack of confidence engendered by legislation which threatens to depreciate the value of the property belonging to the "special interests," who by the way are largely made up of those thrifty individuals throughout the country who seek investment for their savings. This support of the great investing public has been withdrawn and the professional buyers are not strong enough to hold up the weakening market. This icy barrier of distrust has been congealed by the political promises of further anti-trust laws, and until melted by the warming rays of renewed confidence, the stored money of the small investor will be withheld. It is difficult to induce a man to put his savings into a proposed hydroelectric development on government land for whose use the power company has to pay a tax so high as to make it impossible for water generated power to compete with the cheap steam power now available.

These uncertainties are, however, but contributory factors in causing a money drought. This stream has also been greatly reduced by "the high cost of living." which has been more accurately stated "the cost of high living." We also read in the daily papers that millions of dollars are being spent for automobiles, which are not only a means of diversion for the owners but also one of the causes of the diversion of money flow. With the tremendous reserves now being carried in the savings banks and held in the safe deposit vaults, it can be but a matter of time before this money will inundate the market, when the price of stocks and bonds will reach a new high water mark. The sage advice is to buy now while they are at low ebb.

PERSONALS.

F. W. Jenifer, a telephone official of Los Angeles, is visiting San Francisco.

W. E. Bennett, an electrical engineer of New York, is a San Francisco visitor.

H. M. Bacon, of the San Francisco office of Ford, Bacon & Davis, is at Los Angeles.

James H. Wise, hydraulic engineer with F. G. Baum & Co. of San Francisco, is in Alaska.

W. P. Hammon recently returned to his San Francisco office after an extensive Eastern trip.

William D. Ward, of the Pelton Water Wheel Company's sales department, is in Southern California.

Marshall W. Gleason of the Gleason, Tievout Company of Brooklyn, N. Y., is visiting the Pacific Coast.

Thomas Mirk, of Hunt, Mirk & Co. of San Francisco, has returned from a business trip to Puget Sound.

Sidney Sprout, electrical engineer, has returned to his San Francisco office after visiting Oxnard, Cal.

E. J. Kendall, of Ukiah, superintendent of the Snow Mountain Power Company's system visited San Francisco last week.

Tracy E. Bibbins, assistant Pacific Coast manager of the General Electric Company, recently returned from an Eastern trip.

Walter M. Fagan, manager of the Los Angeles offices of the National Conduit and Cable Co., was at San Francisco this week.

W. S. Heger, Pacific Coast district manager for the Allis-Chalmers Company, visited his Los Angeles office during the past week.

E. C. Johnson has been appointed engineer in charge of maintenance of way and construction of roadway and buildings for the Pacific Railway at Santa Monica.

W. W. Briggs, Pacific Coast district manager of the Westinghouse Electric & Manufacturing Company, has returned to San Francisco from an outing in the mountains.

C. O. G. Miller, president of the Pacific Lighting Company, of Los Angeles, has returned to his home at San Francisco after a summer vacation spent in automobiling in Southern California.

C. A. Coolidge has been appointed general manager of the Oregon Electric Railway, Portland, Ore., to succeed Mr. Guy W. Talbot, who resigned to become president of the Portland Gas & Coke Company, Portland, Ore.

H. L. Kirker, an engineer with the railway and lighting department of the Westinghouse Electric and Manufacturing Company, recently arrived from Pittsburg and spent a few days at the company's San Francisco office.

E. M. Frazer, inventor of the Frazer electric elevator system, which was purchased by the Otis Elevator Company several years ago, has returned to his home at Yonkers, N. Y., after spending several months at San Francisco.

J. B. Coggins, manager of the Postal Telegraph Company's Denver office, has been assigned to take charge of the company's San Francisco business. Mr. Coggins has advanced steadily since his start with the company as messenger boy.

G. W. Slocum, the engineer of the Portland Railway, Light & Power Company, has returned to Portland after spending a week at San Francisco. He was at one time in charge of the North Beach plant of the United Railroads of San Francisco.

Wynn Meredith, Pacific Coast manager for Sanderson & Porter of New York, is expected at his San Francisco headquarters about August 3, after spending the past month in British Columbia, principally in connection with the installation of the Jordan river development.

Chas. F. Stamps, Jr., 631 South Hill St., Los Angeles, has been appointed novelty editor of the Pacific Coast Gas Association, vice G. H. Holliday, resigned.

George S. Binckley, who has been connected with the British Columbia Electric Railway Company Ltd., as consulting engineer and chief hydraulic engineer for nearly two years past, expects to conclude his work in British Columbia in September, and resume his consulting practice in Los Angeles.

J. F. Adams, for some time Reno manager for the Pacific Telephone and Telegraph Company, has resigned his position to take charge of the Nevada-California-Oregon Telephone and Telegraph Company in the position of general manager. He has been succeeded by E. H. Heffernan of Sacramento, Cal., who has been in the service of the company for a number of years as district manager.

R. A. Philips, an engineer connected with Stone & Webster, of Boston, has arrived at San Francisco. It is understood that he is here in connection with the taking over of the operation of W. P. Hammon's electric power plants at Reno and elsewhere on the Truckee River by his firm. The Hammon interests will still hold the control, but Stone & Webster will improve and operate the system.

H. H. Noble, president of the Northern California Power Co., took a large party of electrical men, capitalists and engineers to Heroult, Shasta County, last week to inspect the operations of the Noble Electric Steel Co.'s electric iron smelter. The furnace was tapped every six hours and the output has been from 16 to 20 tons daily. Among those in the party were: Edward O'Neill, professor of chemistry, University of California; Richard B. Carr, Carnegie Steel Co.; C. B. Morgan, secretary, Noble Electric Steel Co.; C. R. Downs, Amador Water and Light Co.; G. K. Weeks, of N. W. Halsey & Co., and S. T. Wellman, chairman of the Wellman-Seaver-Morgan Co., of Cleveland, O. An additional furnace will be built at once.

JOBBERS' MEETING.

A meeting of the Pacific Coast Jobbers' Association will be held at Del Monte, California, August 5, 6 and 7.

TRADE NOTES.

The Oahu Railway and Land Co., of Honolulu, has purchased from the General Electric Co. two additional C. C. 2, 7 kw., 5,000 r.p.m., 125 volts d.c. non-condensing Curtis steam turbines. It is supposed that they will be used for train lighting purposes.

The General Electric Company reports the following sale to the San Diego Consolidated Gas and Electric Co. (H. M. Byllesby & Co., engineers): One A. T. B. 4, 2,000 kw., 1,800 r.p.m., 2,300 volts, horizontal condensing Curtis steam turbine. The company has already installed a smaller vertical steam turbine.

It is an interesting fact, perhaps not generally known by operating telephone men, that precious metals such as platinum, gold and silver, and even precious stones such as diamonds, are used extensively in the manufacture of telephone apparatus. The Western Electric Company, the largest manufacturer of telephones in the world, uses upwards of one ton of platinum each year.

NEW CATALOGUES.

The July number of "The J.-M. Packing Expert," from H. W. Johns-Manville Company, contains announcement of the new J.-M. metallic packing and also of J.-M. asbestos non-burn brake band lining.

INDUSTRIAL

VERTICAL CARBON FLAME ARC LAMP FOR D. C. SERIES, MULTIPLE AND MULTIPLE SERIES SERVICE.

The remarkable efficiency, pleasing appearance, and exceptional quality of light which characterizes the flame arc lamp has rendered it pre-eminently adapted for the economical illumination of large areas, and it is now generally conceded that the flame arc lamp is the most efficient illuminant yet developed, and that the penetrating quality of the brilliant, golden yellow light is such that even under the most adverse atmospheric conditions, such as those imposed by fog or smoke, it provides a highly satisfactory illumination.

G. E. 6.6 Ampere, 110-Volt Vertical Carbon Flame Arc Lamp.

Previous to the advent of the 6.6 ampere vertical carbon d. c. flame arc lamp manufactured by the General Electric Company, the installation of flame arc lamps on 6.6 ampere d. c. circuits was not entirely satisfactory on account of the large and wasteful resistance necessary. This new lamp is designed for connecting directly in a 6.6 ampere d. c. circuit without any change in the system, simply replacing the other lamps where desired.

Although these lamps are now made for d. c. service only, they find a wide application, being suitable for lighting squares, parks, or special store sections in cities where the 6.6 ampere series luminous arc, or the series d. c. enclosed 6.6 ampere systems is used for street lighting. They are adapted for multiple and multiple series service in addition to the above.

The lamps are equipped with a light opal globe and a 26-in. diffuser. The casing, which is of copper with black oxidized finish, is made up in two sections so arranged that, by telescoping the sections, the mechanism is exposed, rendering it unnecessary to remove the entire casing in order to see that the lamp is properly trimmed.

The arc is held in the same position at all times, as the mechanism is of the focusing type. With the exception of this feature, the lamp mechanism is similar to that used in the standard d. c. enclosed lamp, which has given perfect satisfaction during years of service.

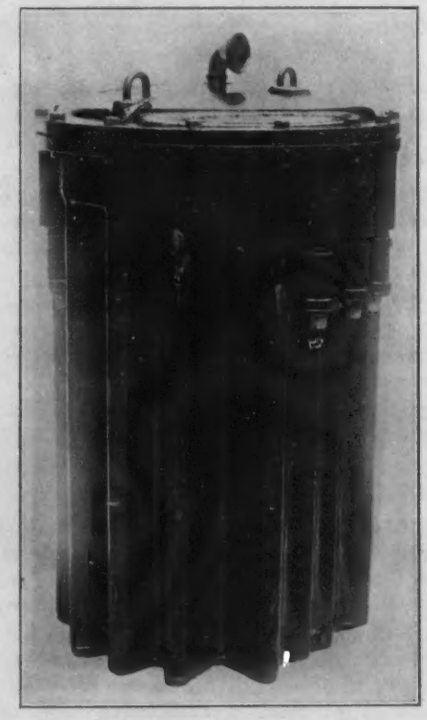
The lower carbon holder is provided with a ball and socket joint to allow perfect alightment of both carbons. A life of about 20 hours is obtained with one trim when the lamp is adjusted for 6.5 amperes. The design and the materials used are such as to combine attractive appearance, great strength and durability with minimum weight.

Particular attention is called to the increased illuminating efficiency obtainable—an average of 2800 mean lower hemispherical c. p. places this lamp on a basis 50 per cent higher than the average flame lamp manufactured in this country or abroad. This increased efficiency, combined with the fact that lamps may be connected directly in the circuit offers the Central Stations operating d. c. an opportunity to take over the lighting of foundries, wharves, etc.

SEVERE SERVICE CONDITIONS REQUIRE IMPROVED MANHOLE TRANSFORMERS.

There is a growing demand for distributing transformers to be installed in underground vaults, called manhole or subway openings, that furnish access to underground systems of distribution. This demand comes from the larger companies who are operating in the big cities, and is for an absolutely first-class unit, with regard to both operating efficiency and adaptability to the service conditions.

As these transformers are installed in subway manholes which are liable to flooding from heavy rains or overflow water, one of the main requirements of service is that the manhole transformers shall be water and air tight; that is,



Improved Manhole Transformer.

the joints between the case and cover and where the leads issue from the case must be water and moisture proof. Hence, it is necessary to enclose the transformer in a hermetically sealed case, and design it for an exceedingly low tempera-

ture rise. This demands careful design as well as the highest grade workmanship. At the same time, the transformer must not only be so constructed that it is possible to make it water-tight, but such that the unit can be installed quickly and easily. Also, it is necessary that the design permit the transformer to be connected to or disconnected from the line without removing the cover or otherwise opening the case.

Any expansion of the oil under a rising temperature, of course, compresses the air in the upper portion of the transformer case and causes a rise in pressure. Under abnormal operating conditions, such as a short circuit, a considerable rise in this pressure may occur, which will make the transformer case liable to serious injury. In order to avoid any danger from such occurrences, a safety or relief valve for any excess pressure should be provided. The completed transformers should be tested at the factory at a sufficient air pressure to insure their being air-tight and moisture-proof.

The Westinghouse type "S" manhole transformer fulfills the foregoing conditions of service and exactions of design and is rapidly increasing its popularity. The magnetic circuits and coils of this transformer are the same as those of the well known Westinghouse type "S" transformer, but they are mounted in a case of special design that adapts them to manhole service.

The accompanying illustration shows the transformer supplied by the Westinghouse Electric & Manufacturing Company to the Kentucky Electric Company, Louisville, Ky., one of the largest electrical companies in the country employing underground distribution. The many advantages of this type of construction have led to its adoption for the entire line of transformers designed for manhole service.

ANOTHER KELLOGG CONTRACT.

G. A. Joy, western sales engineer for Kellogg Swithboard & Supply Company, announces the closing of a contract for a complete exchange equipment for Cape Girardeau Bell Telephone Company, Cape Girardeau, Mo. The new switchboard and apparatus will be installed in a new building specially fitted for the service, the company having purchased the Stone building on Broadway and Ellis street, which will be used as the central office and general offices of the organization.

The entire second story of the big building is being remodeled to suit the needs of the business. Adjoining the large operating room will be rest rooms for the operators, which will be fitted with lounges, chairs and other comforts. The four rooms for the offices will be fitted with modern telephone office equipment. On the same floor will be placed the distributing frames, racks, storage batteries and power plant. Supply and tool rooms will be in the basement.

The switchboard is to have an ultimate capacity of 3000 lines, a present equipment of 1000 common battery lines; ten toll and thirty rural lines. Three sections will be installed at once. The common battery lines are divided among six operators with two additional operators for toll and rural connections.

Each of six common battery positions will be equipped with 15 cord circuits with undivided four party keys for ringing four frequency bells on a metallic line without use of ground. The toll and rural positions will be equipped with combination cord circuits arranged to make connection between toll to toll and toll to common battery lines.

There will be a one position chief operator, and a one position wire chief's desk; a main distributing frame, intermediate distributing frame and relay racks.

The power plant will include the furnishing of storage battery system, a mercury arc, arc rectifier, Kellogg four frequency pole changers, two sets of transformers and slate power board. The equipment will be Kellogg Standard throughout.

BOOKS RECEIVED.

"The Watthour Meter," by Wm. M. Shepard and Allen G. Jones; 179 pages, 5½x8½; 103 illustrations. Technical Publishing Company, San Francisco. Price, $2.00.

The electric generator and the prime mover which drives it have always been in the foreground of interest, but it has taken many years for most engineers to realize that the machines are dead masses of metal without proper switches and controlling devises to make their power useful. In this respect the last years have seen great improvements and in many of our large electric generating systems now give just as much or even more attention is paid to the control of the system as to the generating plant.

The meter, however, which stands at the other end of the system, between the customer and the supply circuit, is still for most electrical engineers an apparatus to which little attention is paid and one of which little is known. The more progressive central station companies indeed, have given a great deal of attention to the meter as one of the most important elements of the system and it is largely due to the efforts of these companies that the meter, just as the incandescent lamp, has reached such a high state of perfection.

Nevertheless it is not yet realized by many engineers that carelessness in the choice of meters and neglect in their care and maintenance may easily lead to losses of revenue greater than all the losses in generators and transmission and distribution circuits to which so much attention is paid, and that the question of properly metering electric circuits in many cases is of as great or greater importance than any other problem which the electrical engineer has to meet.

For this reason the above-named book is a very desirable and useful addition to the electrical literature as it brings before the reader in a short and simple manner and with the least amount of technical formalism, but in easily understood language all the problems of the meter as an element of the electric circuit.

The book deals with the different methods of metering direct current, single phase, alternating and polyphase circuits, two-wire, three-wire and four-wire circuits. It explains the principles and discusses the operation of the different forms of the various types of watthour meters which are in use, such as the induction meter, the commutator meter, etc.

It goes into the discussion of the relation of the meter with the system, the underlying principles of its application, the limitation and possible difficulties met in the meter and numerous other subjects of importance in this field and therefore is a book which will be of interest and benefit to every electrical engineer and should be read and carefully studied.

Charles P. Steinmetz

Flying Machines, Their Construction and Operation. By W. J. Jackman, Thomas H. Russell and Octave Chanute; 221 pages, 5½x7½ inches; well illustrated. The Charles C. Thompson Co., Chicago, and The Technical Book Shop, San Francisco. Price, $1.00.

This volume explains the principles of flying. The various forms of gliders, monoplanes, bi-planes, etc., are discussed and a historical resume of their development traced. From this the transit is short to motor driven machines, details as to the weight and power of the various makes of American and foreign gas engines being included. Full directions are given for constructing such machines by amateurs and many practical hints on handling them. This is a dangerous book to put in the hands of an ambitious boy, for it makes the science of aviation so attractive that he would be tempted to do likewise.

NEWS NOTES

TRANSMISSION.

CLOVERDALE, CAL.—C. A. Feldmeyer, manager of the Cloverdale Light and Power Company, is installing a 500 k.w. regulator at the sub-station at Asti.

BOZEMAN, MONT.—Dr. Carl Schroeter of Chicago is negotiating with the local city authorities with a view of establishing a gas plant at a cost of $100,000.

VALE, ORE.—The City Council has made arrangements for the water and sewerage system for Vale. The American Light & Power Company has been given the contract, the bid being $63,490 for both systems.

TACOMA, WASH.—Wright, Sweeney & Cummings have assigned to Geo. Milton Savage and W. Nichols the contract for constructing the head work and tunnel of the $2,000,000 municipal power plant in the Nisqually river.

BAKERSFIELD, CAL.—The Board of Supervisors sold to the Mt. Whitney Power Company for 50 years, a franchise to erect poles and string wires over the public highways for the transmission of light and power in Kern county.

LEWISTON, IDAHO.—The Lewiston, Clarkston Investment Company has closed a contract with the Washington Water & Power Company of Spokane for electric current to be received at Moscow on a new transmission line to be constructed from Palouse to Moscow, to connect there with the Lewiston system.

OAKLAND, CAL.—An application has been made to the Board of Trustees of the town of Emeryville for a franchise right, privilege and permission to erect, etc., lines for transmitting and distributing electricity along, across, upon and over certain roads, highways, public ways, and streets of Emeryville, by the Great Western Power Company.

BOISE, IDAHO.—E. C. Crocker, vice president of the Snake River Irrigation Company, states that the contracts have been closed for the construction of the dam and power house for the Castle Butte project, located 38 miles south of Boise, on the north bank of the Snake river, between the mouth of the Bruneau river and Swan Falls, the work involving an expenditure of more than $500,000.

ROSEBURG, ORE.—J. L. and S. A. Kendall hydroelectric plant at Roseburg has a turbine connected to a 200 k.w., 60-cycle, 3-phase, 6600-volt alternator during the wet season, but during the dry season the water supply is inadequate, and to care for the load a 20 by 36 "Reliance" type heavy duty engine is being furnished by Allis-Chalmers Company. This will be belted to the generator and will drive it when necessary.

NEVADA CITY, CAL.—The Middle Yuba Hydroelectric Company has received a carload of transformers for the new plant on the Middle Yuba river. They stand eight feet high and just barely passed through the narrow gauge tunnel at Town Talk. Good headway is being made in building the new road for the company from the Middle Yuba river to Minnesota, while it is expected to have the new power line from Pike City to Alleghany completed within the next few weeks.

GUNNISON, UTAH.—The Gunnison Valley Power Company is developing its water power site and has recently placed an order with Allis-Chalmers Company for the necessary equipment. This will include a 540 h.p. single horizontal turbine with cast iron spiral case, operating under a head of 210 feet, direct connected to a 300 k.v.a., 2300-volt, 60-cycle, 3-phase, 450 r.p.m. alternator. A 10 k.w. exciter will be direct connected to an extension of the main shaft. Three 100 k.v.a. oil-filled, self-cooled transformers will be used to step up the voltage for transmission.

PROVO, UTAH.—The Knight Power Company of this city has recently placed an order with Allis-Chalmers Company for the hydraulic turbines to be used in its hydro-electric development at Heber City. There will be two 1650 h.p., 514 r.p.m. single horizontal turbines operating under a head of 170 feet. These turbines will be identical except that different material will be used for the runners of each turbine. The Power Company wishes to satisfy itself as to certain points and has ordered one runner to be made of bronze and the other of cast iron. The result of this comparison will be watched with considerable interest. Another interesting feature is that the turbines will not be provided with governors. A regulating cylinder operated by the penstock pressure which can also be controlled electrically from the switchboard or mechanically from the turbine will be used ordinarily for regulation. In case of emergency a direct mechanical gear can be placed in operation.

ILLUMINATION.

SALT LAKE CITY, UTAH.—Requests for bids on the electric wiring and equipment of the Newhouse theater have been sent to many electrical contractors.

LOS ANGELES, CAL.—A resolution recommending that the City Trustees of Alhambra call a bond election for the purpose of constructing a municipal light plant, has been unanimously adopted by the Board of Trade of that city.

OROVILLE, CAL.—The Great Western Power Company which has begun the work of building a large concrete dam in the Feather river at the intake to the tunnel, has taken the task of solving the labor problem for itself and has a special man in Sacramento hunting men to work at the dam.

OAKLAND, CAL.—Crossed wires started a fire that destroyed the power house and engine house valued at $50,000 on the I. W. Hellman Jr. estate at San Leandro at 9:30 a. m. July 21. The destruction of the power and engine house has temporarily deprived the Hellman grounds of electric lights, though a connection was made with the San Leandro town lighting wires later. The household is depending on a supply of water held in a reserve tank. The reconstruction of the power house will be commenced immediately.

RENO, NEV.—Stone & Webster have assumed the management of the Sierra-Pacific Electric Company. This company owns all stocks of companies which do the entire electric lighting and power business in the cities and towns of Reno, Sparks, Virginia City, Carson City and Silver City, Nev., and in the surrounding important mining and irrigation districts of western Nevada. The companies also do the entire gas business in Reno, Sparks and Carson City, and supply water for domestic purposes in Reno and Sparks. Also they do a very considerable power business with mines and mills, including some of these located on the Comstock lode and in the Yerington copper district. The companies own and operate four hydroelectric plants on the Truckee river. They have a combined capacity of 7300 h.p. As the water-power now developed is insufficient to supply the present and increasing demand for electric power, a new plant of 9000 h.p. will be constructed at once and further developments will be undertaken. It is estimated that ultimate developments aggregating 150,000 h.p. will be made.

TRANSPORTATION.

BILLINGS, MONT.—The Eastern Montana Electric Railway Company, composed of Billings capitalists, has begun the work of making a permanent survey of the line from this place to Bear Creek.

EL PASO, TEX.—The El Paso Electric Railway Company has presented a petition requesting permission to construct tracks along Gladstone and Mundy avenues. A resolution has been adopted giving the company privileges to extend its tracks.

SAN FRANCISCO, CAL.—The San Francisco Electric Railways of which Lewis F. Byington is president, have filed an instrument which leases to the United Railroads for a period of 21 years the rights, franchies and property, including 100 cars, of the Parkside line.

VALLEJO, CAL.—City Attorney William T. O'Donnell is now looking into the law with the view of determining just what legal steps are necessary to have the permit of the proposed electric road of the Vallejo Traction Company to the White Sulphur Springs declared null and void.

HANFORD, CAL.—John B. Rogers, general manager of the Hanford & Summit Lake Railway, announced that surveys will be started in the city of Hanford and from those surveys that the estimates will be made and bids invited for the construction. No city line has as yet been planned but later ordinances will be prepared and franchises sought.

SACRAMENTO, CAL.—The Sacramento Electric, Gas & Railway Company has decided to make extensive improvements in the matter of trackage immediately following completion of the underground conduit system for electric wires. The first improvement will be the continuation of double tracks from Tenth and P streets along Tenth to Y street. The matter of running a line of cars out E street is also under consideration and in all probability will be approved.

OAKLAND, CAL.—Work has commenced on the six blocks' extension of the Liese avenue car-line from Penniman avenue, to Key Route Heights tract, where it is planned to construct a depot which several lines of the company will converge. This is on the line of the projected extension of the Key Route to San Jose, and it is understood that in addition to the Key Route and Liese avenue lines meeting here, the extensions of the Dimond and East Twenty-seventh street lines will also pass this point. It is expected that eventually the Liese avenue line will be extended to Mills College.

OAKLAND, CAL.—To relieve the crowded condition of the street cars because of the fast growing population of the suburbs and especially the newly annexed East Oakland district, the Oakland Traction Company has ordered built 20 large, modern cars at a cost of $140,000. These cars will be built at the traction company's car shops on Yerba Buena avenue, and will be hurried to completion as fast as possible. The rapid growth of Fruitvale, Melrose, Elmhurst, Fitchburg, and Dimond is said by Supt. W. F. Kelly of the traction company to be the cause of the increase in cars. The heavy passenger traffic to these districts during certain hours of the day cannot be properly accommodated without an additional equipment.

TACOMA, WASH.—The North Coast Railroad, now building across Washington, are preparing to operate the first standard-gauge railroad across the Cascade mountain range by electricity. In the Yakima valley and along the Columbia river Robert Strahorn, president of the North Coast Company, and his associates are developing several great hydroelectric plants. It has become known during the last week that one of the greatest Western electric power projects is being developed at Packwood lake, near the headwaters of the Cowlitz river, approximately ninety miles southeast of Tacoma. The power plant when complete will cost $3,000,000, with transmission lines to Tacoma, Seattle, North Yakima and other towns in Central Washington. The project is said to be intimately connected with the North Coast Railway, with the object of supplying the power by which that railroad will operate its trains across the Cascades.

WATERWORKS.

NORTH BEND, ORE.—North Bend will in the near future be equipped with a modern system of water and sewer works, estimated to cost about $75,000.

TACOMA, WASH.—Contract for the new water system at the county poor farm has been awarded by the Board of County Commissioners to Nevins & McKeiv for $3678.

SPOKANE, WASH.—The Council has passed an ordidance authorizing and directing the Board of Public Works to enter into a contract with Elmendorf & Elmendorf for water mains in Manito Heights Addition.

ALAMEDA, CAL.—Mayor Noy has received a reply from President Tevis of the water company to his letter regarding an extension from two to ten years of the purchasing option to be given Alameda, in case the city decides to install a distribution system and purchase water from the Bay Cities Company. In it Tevis says that the directors of the company are averse to giving more than a two-year option. Tevis says: 'Any change in conditions would involve a withdrawal of statements made to our bankers and interfere with the company carrying out an arranged form of pledge, and would also interfere with financial negotiations now pending. However. I am assured that if you and your associates in the city government feel that you must insist upon the point, the period will be extended to cover five years from the date at which the distributing system is completed and placed in commission.

SAN FRANCISCO, CAL.—It has been announced in Judge Conley's Court that the Spring Valley Water Company has threatened to cut off the water supply of the steamship companies on July 20 if they refuse to pay the rates as fixed by the injunction of Judge Van Fleet. The rates the steamship companies are willing to pay are those established by the Supervisors last month for the fiscal year 1910-1911. These rates are considerably lower than the injunction rates. William Madden, attorney for the Pacific Mail Steamship Company and the S. F. & Portland Steamship Co., and W. H. Gorrill, attorney for the Pacific Coast Steamship Company, informed Judge Conley they would file complaints in intervention in the Minaker suit so as to enable them to seek restraining orders preventing Spring Valley from cutting off their water supply. The water company appealed to the Supervisors to have $1,000,000 chopped off its franchise assessment. Assistant Manager Behan appeared before the Board of Equalization to call attention to the fact that the amount allowed the company for the expense of "taxation" in making up the annual rates ordinance was $24,000 short of the sum actually charged by the Assessor for taxes. Behan suggested that as the law allowed the corporation to count its taxes along with "operating expenses," in deducting from receipts to arrive at its "income," and that as franchise value was not counted in fixing the rates, the Board should reduce this item from $2,500,000 to $1,500,000. The Board denied the water company's request, and directed the city attorney to file a suit of intervention in the injunction proceedings brought by Dr. A. W. Minaker against the Spring Valley Water Company to prevent it from charging more than the rate for water established by the Supervisors. The action of the Supervisors has taken the burden from Dr. Minaker of raising a bond of $100,000 and prosecuting the action in the courts, as this will now devolve upon the City Attorney and the municipality is not required to give a bond.

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